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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/806,118	03/23/2004	Edward Hurley	INTEL-0069	2131

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EXAMINER	
BEVERIDGE, RACHEL E	
ART UNIT	**PAPER NUMBER**
1725	

DATE MAILED: 05/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/806,118	HURLEY ET AL.	
	Examiner	Art Unit	
	Rachel E. Beveridge	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17 and 31-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 31-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election of Group I (claims 1-17) in the reply filed on March 30, 2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election **without** traverse (MPEP § 818.03(a)).

Applicant's cancellation of the non-elected Group II, regarding claims 18-30 is acknowledged.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-14 and 37-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sreeram et al. (US 6,653,741 B2) in view of Totino et al. (US 2002/0079355 A1).

With respect to claims 1-12, 14, and 37-41, Sreeram discloses a "substrate" referring to a semiconductor and/or a heat sink component and/or any other article, device, or apparatus, etc. which is joined to another with a thermal interface material (TIM) (Sreeram, col. 3, lines 27-30). Sreeram also discloses the TIM should bond to the substrate at a temperature less than the failure temperature of the active electronic

device (col. 3, lines 31-33) and that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38). Sreeram discloses that the TIM preferably does not require extrinsic fluxing (col. 4, lines 36-39). Sreeram states that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38). Sreeram discloses "pre-wetting" the components to ensure bonding with the bonding component during reflow (col. 7, lines 42-44). Sreeram discloses active solder and TIM's that can wet non-metallic surfaces, such as Au, Au/Ni, and Ni (col. 5, lines 58-59). Sreeram discloses materials that enhance the thermal conductivity of the component, such as silver, copper, and gold (col. 3, lines 63-66). Sreeram discloses that these metals typically have relatively high melting temperatures (col. 3, lines 66-67). Also, Sreeram states that chemical fluxing is used when attempting to join items with conventional solders at temperatures below about 300° (col. 4, lines 26-28). Sreeram discloses active solder comprising indium (col. 5, lines 5-6). Sreeram discloses a heat sink or a heat spreader made of copper and/or aluminum components (col. 1, lines 14-15). Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused metals (col. 1, lines 51-55). Sreeram teaches heating the TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24). Furthermore, Sreeram states that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical

bond between the TIM and the substrate when solidified (col. 3, lines 35-38). However, Sreeram lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with means of heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (Totino, p.2, ¶ 0029, lines 1-3). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Sreeram to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

With respect to claim 13, Totino discloses the vacuum at a "fairly high" pressure so that the residual pressure in the chamber is less than 10^{-4} mbar, typically between 10^{-4} and 10^{-5} mbar (Totino, p.1, ¶ 0016, lines 1-5). Put another way, Totino teaches the fairly high vacuum pressure to be an art recognized result effective variable depending on the type of material to be used. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the invention of Sreeram

to include the fairly high pressure of Totino in order to avoid contamination of the assembly and/or possible pollution by the gas of the controlled atmosphere to prevent weakening of the metallic solder at the heating temperature (Totino, p.1-2, ¶ 0016, lines 5-10). That is it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that there are general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Claims 15-17 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sreeram et al. (US 6,653,741 B2) in view of Totino et al. (US 2002/0079355 A1).

With respect to claims 15-17, Sreeram discloses a "substrate" referring to a semiconductor and/or a heat sink component and/or any other article, device, or apparatus, etc. which is joined to another with a thermal interface material (TIM) (Sreeram, col. 3, lines 27-30). Sreeram also discloses the TIM should bond to the substrate at a temperature less than the failure temperature of the active electronic device (col. 3, lines 31-33) and that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38). Sreeram discloses materials that enhance the thermal conductivity of the component, such as silver, copper, and gold (Sreeram, col. 3, lines 63-66) and discloses that these metals typically have relatively high melting

temperatures (col. 3, lines 66-67). Also, Sreeram states that chemical fluxing is used when attempting to join items with conventional solders at temperatures below about 300° (col. 4, lines 26-28). Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused metals (col. 1, lines 51-55). Sreeram teaches heating the TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24). Sreeram discloses that the TIM preferably does not require extrinsic fluxing (col. 4, lines 36-39). Sreeram discloses Nickel particles as thermally conductive non-fusible fillers (Sreeram, p.2, ¶ 0021, lines 5-8). However, Sreeram lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with means of heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). Totinio also discloses the possibility of avoiding contamination of the elements of the assembly and/or possible pollution by the gas of the controlled atmosphere, which may be, for example, oxygen contained in the industrial gases (p.1-2, ¶ 0016, lines 5-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Sreeram to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order

to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

Claims 31-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sreeram et al. (US 6,653,741 B2) in view of Totino et al. (US 2002/0079355 A1).

Sreeram discloses a "substrate" referring to a semiconductor and/or a heat sink component and/or any other article, device, or apparatus, etc. which is joined to another with a thermal interface material (TIM) (Sreeram, col. 3, lines 27-30). Sreeram also discloses the TIM should bond to the substrate at a temperature less than the failure temperature of the active electronic device (col. 3, lines 31-33) and that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38). Sreeram discloses materials that enhance the thermal conductivity of the component, such as silver, copper, and gold (Sreeram, col. 3, lines 63-66) and discloses that these metals typically have relatively high melting temperatures (col. 3, lines 66-67). Also, Sreeram states that chemical fluxing is used when attempting to join items with conventional solders at temperatures below about 300° (col. 4, lines 26-28). Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused metals (col. 1, lines 51-55). Sreeram teaches heating the

TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24). Sreeram discloses that the TIM preferably does not require extrinsic fluxing (col. 4, lines 36-39). Sreeram discloses Nickel particles as thermally conductive non-fusible fillers (Sreeram, p.2, ¶ 0021, lines 5-8). However, Sreeram lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with means of heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). Totinio also discloses the possibility of avoiding contamination of the elements of the assembly and/or possible pollution by the gas of the controlled atmosphere, which may be, for example, oxygen contained in the industrial gases (p.1-2, ¶ 0016, lines 5-10). Totino discloses a controlled atmosphere that may be a vacuum or an inert gas, such as argon or nitrogen (p.1, ¶ 0015, lines 1-3). Totino discloses the brazing material (4) to be a fusible alloy or a fusible metal, and states that it "can possibly" contain a flux (p.2, ¶ 0031, lines 1-3). Therefore, it is implied by Totino that a flux is not always contained in the brazing material and thus satisfies the applicant's claim requirement "without a solder flux." It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Sreeram to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link

between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

Response to Arguments

Applicant's arguments with respect to claims 1-17 (over Sreeram in view of Totino) have been considered but are moot in view of the new ground(s) of rejection.

In response to applicant's arguments against the references individually (regarding claims 10-12 and 14, page 10), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues, "at the time of the present invention, the present application and Rumer [US 2003/0178730 A1] were commonly assigned to Intel Corporation and/or were under obligation of assignment to Intel Corporation. Accordingly, under 35 U.S.C. §103(c), Rumer is disqualified as a prior art reference in an obivousnes-type combination" (page 11). Applicant's arguments, see page 11 (as stated immediately above), filed March 30, 2006, with respect to claims 10-12 and 14-17 (over Rumer in view of Totino) have been fully considered and are persuasive. The rejection of claims 10-12 and 14-17 (over Rumer in view of Totino) has been withdrawn.

In response to applicant's argument that there is no suggestion to combine the references (page 12), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Sreeram to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5). Furthermore, applicant argues that the materials of Sreeram and Totino are different, and therefore no combination between the references can be made. However, the examiner notes that Sreeram discloses components made of "exemplary thermal conductivity enhancement materials" (Sreeram, col. 3, lines 63-67). Totino discloses examples of the brazed material including titanium and its alloys and zirconium and its alloys (Totino, paragraphs 0033 and 0034). The examiner points out that the examples provided by Totino are obvious by Sreeram's materials of "exemplary thermal conductivity." Also, Sreeram discloses "active solders" useful for brazing (Sreeram, col.

4, lines 35-67) which are very similar to those of Totino (Totino, paragraphs 0033 and 0034).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant argues that claims 15 and 31 are allowable for all of the reasons previously argued (page 13). The examiner disagrees for the same reasons as stated above regarding the previously argued claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rachel E. Beveridge whose telephone number is 571-272-5169. The examiner can normally be reached on Monday through Friday, 9 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JONATHAN JOHNSON
PRIMARY EXAMINER

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